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On the Taxonomic Status of *Thamnophis butleri* (Cope)

Roger Conant

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During the preparation of revisionary material for a reprinting of the "Reptiles of Ohio" (Conant, 1938), it has been necessary to inquire into the taxonomic status of Butler's garter snake, *Thamnophis butleri* (Cope). This I have done with some interesting results.

Albert G. Smith has recently published two papers that are concerned with this species. In the first of these (1945), he reviewed the *butleri* complex and concluded that two species are involved. The easternmost population, occurring in northwestern Pennsylvania and extreme southwestern New York, he referred to *Thamnophis brachystoma* (Cope); specimens from the rest of the range (southwestern Ontario, Ohio, southern Michigan, Indiana, and extreme southeastern Wisconsin) he considered as *butleri*. Smith accorded each form full specific rank, pointed out there is a gap between the ranges of the two, and that there is no evidence of an intergrading population between them. He showed that in *brachystoma* the maximum number of dorsal scale rows is 17 and the upper labials are normally 6; the corresponding counts in *butleri* are 19 and 7.

In a later contribution (1949) on the subspecies of *Thamnophis radix*, Smith reviewed *butleri* and *brachystoma* again, but this time he reduced them to subspecific status and considered them both as races of *radix*. He concluded that *radix* and *butleri* intergrade in the Chicago region, and, although there is still no evidence of actual intergradation between *butleri* and *brachystoma*, he stated (p. 296) that "consideration of all characters seems to justify the conclusion that *butleri* and *brachystoma* are only partially distinct from each other."

Smith's conflicting views (as expressed in his two papers) require a close examination of the facts, especially since it is known that *radix* and *butleri* occur together and maintain their identities in southeastern Wisconsin (Davis,

1932) and in central Ohio (Conant, Thomas, and Rausch, 1945). The Ohio State Museum, for example, has a specimen of *radix* (OSM 537) and a specimen of *butleri* (OSM 627) from Section 7, Marion Township, Marion County, Ohio, that were found not only in the same locality but in the same habitat.

A close scrutiny of Smith's second (1949) paper indicates he has *not* proved that these two snakes intergrade in the Chicago region or anywhere else. He lists no intergrading specimens, defines no intergrading area, and ignores certain morphological characters that are useful in distinguishing between the two forms. He mentions nothing about the distinctly shorter and narrower head of *butleri*, does not consider the comparative average and maximum sizes of the two forms (*radix* attains much the greater dimensions), and gives no analysis of pattern. In *radix* there are prominent dark maculations on the upper labials and conspicuous paired black spots on each ventral, characteristics that are absent or much reduced in *butleri*. But these are not discussed. Further, he fails to point out the diagnostic importance of the position of the light lateral stripe which, anteriorly, involves only the 3rd and the 4th rows in *radix* and which occurs on the 3rd and adjacent portions of the 2nd and 4th rows in *butleri* (and *brachystoma*). On this subject Smith (1949, p. 296) merely states that in both *butleri* and *brachystoma* "the lateral stripe *begins* to involve a portion of the second scale row." (The italics are mine.)

In seeking to prove intergradation between *radix* and *butleri*, Smith apparently places his heaviest reliance upon similarities in dorsal scale rows and ventral counts. There is some overlapping here, as is discussed below, but the sharing of common characters by two snakes of the same genus is not a unique phenomenon.

Although Smith (1949) did not specifically mention any intergrades, he did make the statement (p. 296) that there are twelve specimens of *radix* from eastern Illinois "in which *all* characters are so close to those of *butleri* that they might be considered valid *butleri*." (The italics, again, are mine.) It is perfectly obvious, however, that he has not considered all characters. In response to my request, Smith has sent me the catalog numbers for the twelve snakes in question. All belong to the collection of the Chicago Natural History Museum, which institution has lent them to me for study. A check upon these specimens reveals that ten are identifiable as *Thamnophis radix*, one is a common garter snake (*Thamnophis sirtalis**), and one, according to

*For use of this name see Schmidt and Conant (1950).

Clifford H. Pope, curator of the collection, is a *Sonora* from Texas. In the last instance there apparently has been an error of some sort, possibly in copying data. At my request, Mr. Pope and D. Dwight Davis, also of the Chicago Natural History Museum, have verified the identifications of these several snakes.

Information obtained from studies made upon the ten specimens of *radix* are summarized below. One which is highly aberrant is discussed separately.

A. (CNHM 720.5, 720.8, 1896.5, 35886, 38032.90, 39392.182, 40573.251, 40573.257, and 40573.307—all from the Chicago area, Cook, DuPage, and Lake counties.) All nine of these snakes have typical *radix* patterns. The lateral stripe is on the 3rd and 4th rows of scales anteriorly, there are strong black maculations on the sutures of the labial plates, and the dark dorsal spots and the markings on the abdomen are conspicuous or at least readily recognizable. Scale counts in some instances are relatively low, but all except one fall within the normal range of variation in *radix*. A single snake (CNHM 39392.182) is unusual in that it has a dorsal scale formula of 17-19-17, a combination which is seldom encountered in either *radix* or *butleri*. Four of these nine specimens, however, have dorsal counts in excess of 19, a condition that is quite rare in *butleri*. One has 20 rows, two have 21 rows for short distances near the head, and another (CNHM 720.5) has a count of 21 for approximately three-eighths the length of the body. It would be difficult indeed to conceive how any of these nine snakes could be considered as intergrades between *radix* and *butleri*. I have no hesitation in assigning them all to *radix*.

B. (CNHM 39392.199—"northwest part of Chicago.") In this specimen the pattern is quite unlike that of the average *radix*. There are no dark spots on the abdomen, the dorsum is uniform dark brown between the stripes, and the pigmentation on the labials, although considerable, is not nearly so dark or so clear-cut as in typical *radix*. In short, this snake, upon gross examination, looks like neither *radix* nor *butleri*. An analysis of the pattern, however, shows that it completely lacks black pigmentation, and there is a consequent suppression of all the conspicuous dark markings. The specimen is also abnormal in that the 2nd row of scales is dropped on each side of the neck a short distance back of the head, a most unusual condition for a garter snake. The loss of the two rows of scales results in a maximum count of 19 instead of 21, and it also serves to depress the light lateral stripe so that it appears (throughout almost the entire length of the body) upon the

2nd and 3rd rows of scales instead of on the 3rd and 4th. The head is relatively large and wide, as in typical *radix*. This snake is a highly aberrant *radix*, and can scarcely be considered, by any stretch of the imagination, as an intergrade between *radix* and *butleri*. It is a male with scale counts as follows: dorsal rows 19-18-19-17-15; ventrals 151; subcaudals 70; upper labials 7; lower labials 9; oculars 1—3; temporals 1—2. It has been skinned out except that the head and tail have been left in situ; the overall length is approximately 510 mm. Since several of these counts fall within the range of overlap between *radix* and *butleri*, the scutellation is of little diagnostic value.

All of the specimens mentioned above (including the common garter snake) were catalogued as *radix* in the Chicago Natural History Museum collection, and Smith apparently was unaware that he was working with a mixed sample. He lists still another species of garter snake under *radix* in his 1949 paper (p. 294)—USNM 25951 from Honey Creek, Vigo County, Indiana. This specimen is actually a member of the *elegans* group, and there obviously has been an error either of bookkeeping or of locality. (At my request Dr. Henry S. Fitch, an expert on western garter snakes, has examined this snake, and he identifies it as *Thamnophis elegans vagrans*, a form not known to occur east of the extreme western parts of South Dakota, Nebraska, and Oklahoma.)

Obviously Smith's arguments for intergradation between *radix* and *butleri* are valueless in view of the above. Attention also should be called to the fact that Davis (*op. cit.*) was unable to obtain any indication of intergradation among the hundreds of garter snakes from the Chicago region which he examined. Davis frankly admitted (p. 116) that he had "hoped to find" evidence of subspecific relationship, but discovered none despite the fact that his studies were made with that expectation in mind. He demonstrated that these two snakes occupy the same territory yet maintain their distinctness in several of the counties of southeastern Wisconsin. Davis also showed (p. 114) that the scale formulas for *radix* and *butleri* tend to approximate each other rather closely in the general Chicago area; *butleri*, there at the western edge of its range, exhibits higher counts than it does farther east. Conversely, population samples of *radix* from the same general area tend to have lower counts than those from farther west.

I think the conclusion is inescapable that *radix* and *butleri* should be considered as distinct species.

There is no question but that these two garter snakes are closely related, and they may have had a common ancestor. Their present and (inferred) past distributions indicate rather clearly, however, that the one (*butleri*) is not necessarily a direct and somewhat dwarfed derivative of the other (*radix*) as

Smith infers. Thomas has expressed the opinion (*in* Conant, Thomas, and Rausch, 1945) that *radix* is a recent invader that probably entered Illinois, Wisconsin, Indiana, and Ohio from the west during the driest (the Xerothermic) of the five climatic periods which followed the retreat of the ice sheets from those states. It was during this dry period that an extensive prairie fauna and flora are believed to have migrated eastward. The more humid and cooler present period, which followed the Xerothermic, is not so favorable for prairie plants and animals, and *radix* exists today, in Ohio (and probably also in Indiana), in isolated prairie relict communities.

Thomas stated (*op. cit.*, p. 67) that: "*Thamnophis butleri* . . . is endemic to the eastern part of the Prairie Peninsula and, except for an isolated Wisconsin population, is not known west of the Illinois-Indiana line. It, too, may be considered as a relict of a former climate, since it exists in isolated colonies throughout most of its range. It seems altogether likely, however, that *butleri*, unlike *radix*, existed prior to the Wisconsin glaciation somewhere near its present range, as postulated by Schmidt (1938). Persisting throughout Wisconsin times beyond the periphery of the ice sheet, it may have spread into the glaciated portions of the Prairie Peninsula soon after the retreat of the ice."

Thomas has based his conclusions upon the extensive analysis of pollens of boreal relict bogs, a subject that has occupied the attention of numerous investigators during recent years, and upon his own intimate knowledge of the flora and fauna of Ohio.

Having considered the relationship between *radix* and *butleri*, it remains to investigate the status of *brachystoma*. Is it subspecifically related to *butleri* or is it entitled to full specific standing? The differences between the two are quite evident, and they are particularly apparent when living, or even preserved, specimens of the two are observed side by side. *Thamnophis brachystoma* is smaller than *butleri*, its head is quite narrow and is not wider than the neck as is the case in *butleri*. In *butleri*, also, there very often is evidence of dark spots between the longitudinal stripes; these are lacking or only faintly indicated in *brachystoma*. The number of dorsal scales, however, is almost invariably constant. Smith (1949, p. 288) shows that the formula in *butleri* is 19-19-17 in 99.68 per cent of the large series of specimens he examined, and the formula for *brachystoma* is 17-17-15 in 99.75 per cent. Hence, if Smith's data are accurate, virtually all specimens can be separated on the basis of dorsal scale rows alone. In addition, the number of upper labials is of considerable diagnostic importance. Again quoting Smith's figures (1945, p. 150), *brachystoma* almost always has 6 of these scales; only 6 specimens (.04 per cent of the total) have 7 upper labials. In *butleri*, the upper labials are 7 in 57 per cent of the specimens, 6 in 39 per cent, and 8 in 4 per cent.

Smith has pointed out (1945, p. 151) that there is a gap between the ranges of *butleri* and *brachystoma*, but the gap actually is much greater than he indicated. The easternmost locality for *butleri* in Ohio (Hiram, Portage County) is invalid. This error is mine, for, at the moment of sending the "Reptiles of Ohio" off to the press, I accepted this record from a colleague instead of examining the specimen myself. I have checked upon it since, and it is actually a ribbon snake, *Thamnophis s. sauritus*. Smith (1945, p. 149) lists this specimen under "Material examined," so here again he evidently has made a misidentification.

M. Graham Netting, of the Carnegie Museum, has devoted much thought and study to *Thamnophis brachystoma*, and he believes that its natural distribution does not extend much farther west or south than Polk, Venango County, Pennsylvania. This snake is unbelievably abundant right up to the edge of its range, and then it stops abruptly. It is very common at Polk, yet Paul Swanson has encountered only one or two specimens during eighteen years of residence a few miles south of that city. Netting believes that the few specimens which have turned up beyond the area of extraordinary abundance (including the one from Sandy Lake, Mercer County, Pennsylvania) may have been accidentally transported into those localities, possibly in the balled roots of shrubs or trees.

In view of the marked difference between them, plus the fact that there is no evidence of an intergrading population, *butleri* and *brachystoma* should be considered as distinct, although related, species. *Thamnophis brachystoma*, like *T. butleri*, is a pre-Wisconsin endemic which, after managing to exist south of the ice sheets, has advanced somewhat northward into glaciated territory following the retreat of the glaciers. On this subject Netting ventures the opinion (in correspondence) that this snake may be a relict almost in situ and that it may have existed during Wisconsin times in essentially the same area which it now occupies. Its present range is predominantly in unglaciated territory. Netting states, "It now inhabits the coldest part of Pennsylvania, and its hibernating efficiency is so great that bitter winters appear to have little effect upon the population density. This being the case, I see no reason why it could not have existed in the same area with an ice front standing only a few miles away. I have been forced to this hypothesis by my inability to locate any edaphic barrier existing today which could operate to limit the spread of the teeming population of *brachystoma*. Therefore, I have come to suspect a climatic factor which might be either high summer temperatures or milder winters with alternation of warm spells and sharp freezes which might take a greater toll."

It is possible that *radix*, *butleri*, and *brachystoma* may all be descended from the same stem-stock, but they are now all sufficiently different to be considered as distinct species.

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